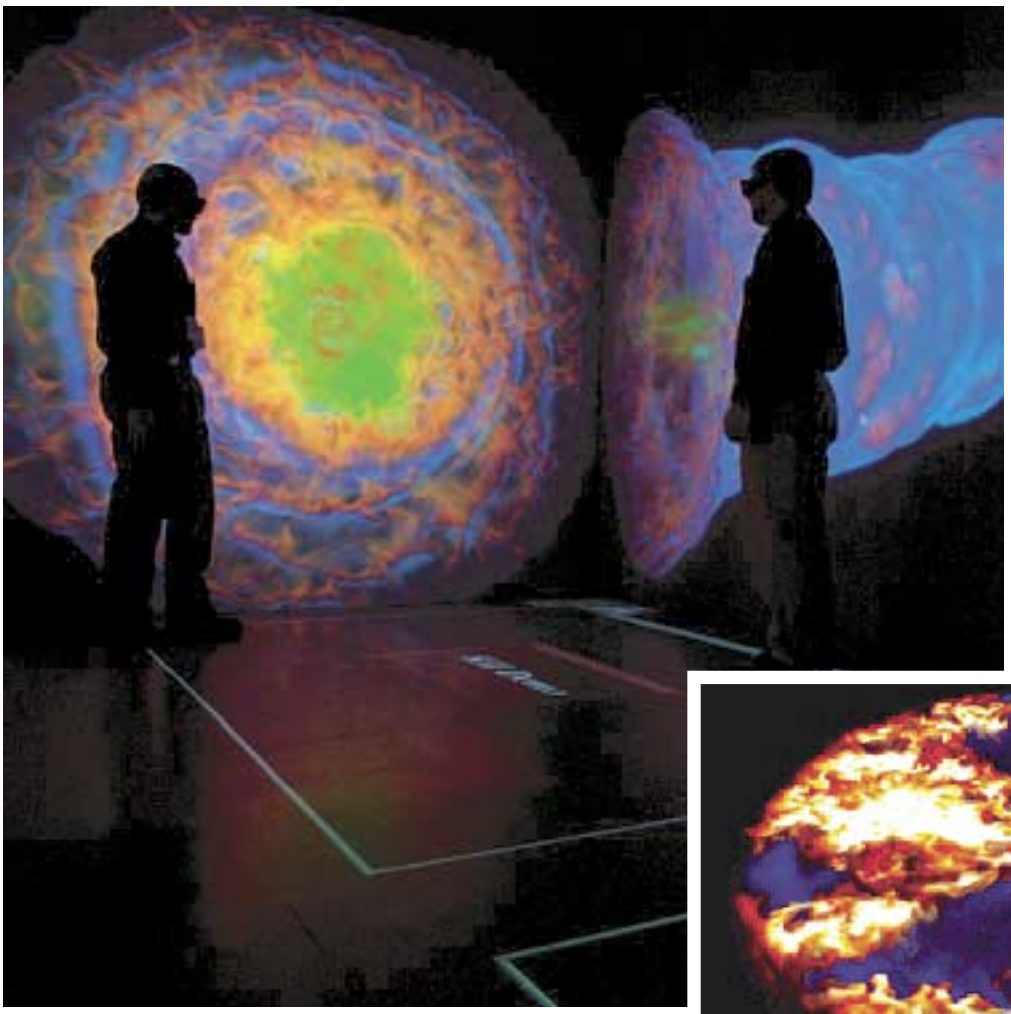
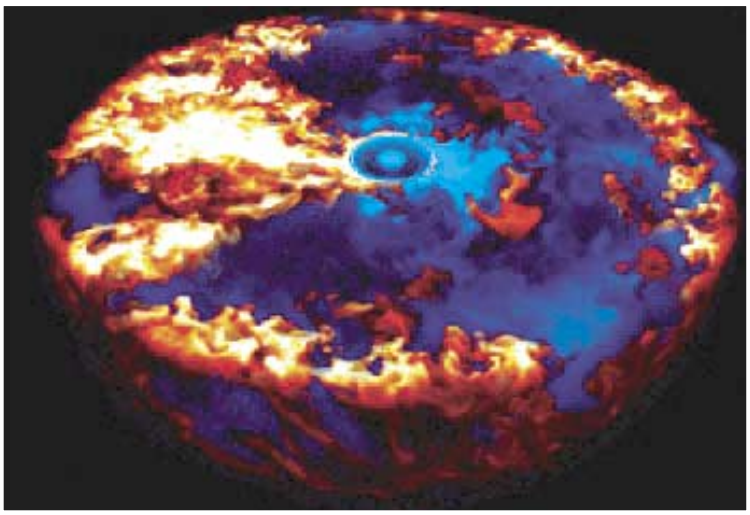
November/December 2001

BITS

computing & communications news





About the front cover:

Scientists throughout the country are starting to apply a tool known as the RAVE (Reconfigurable Advanced Visualization Environment). For example, the inset image shows a multi-wall application of a red giant star's simulated structure. In this instance, the star has been cut in half and colored based on the temperature of the gases within (red representing hot and blue representing cold). This movie is shown in stereo in the RAVE using tools provided by the University of Minnesota.

These same tools produced a simulated hypersonic jet visualization (background image) depicting flow into a space that is 100 times more dense than the jet material itself. There are a variety of small, three-dimensional features that develop late in the simulation time scale that are quite easy to see in the RAVE, but these probably would be difficult to recognize on a conventional monitor. The xmovie application from Lawrence Livermore National Laboratory plays this movie in non-stereo mode.

This image shows axial and side views of hypersonic turbulent jet flow. The RAVE can display multiple views of the jet flow synchronized in time. For example, in one view we look right down the jet itself and in the other side views we have adjusted the transparency of the outer shells to enable us to see inside the turbulent material (this image only shows two of the four viewpoints).

EnSight software was used with the RAVE to produce this image. A three-dimensional model of the recently collected Cerro Grande Fire burn data was placed onto a topographic map of the Pajarito Plateau and the Jemez Mountains near Los Alamos, New Mexico. The RAVE can project this data set in stereo to the four upright walls. The data consist of elevation data from the USGS and burn data from the BAER team. Bob Greene of High Performance Computing Environments assembled the data and the visualization.

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From ASCI to SCC: Fakespace Systems Knows How to Visualize

By Octavio Ramos Jr., BITS Managing Editor, Communication Arts & Services, IM-1

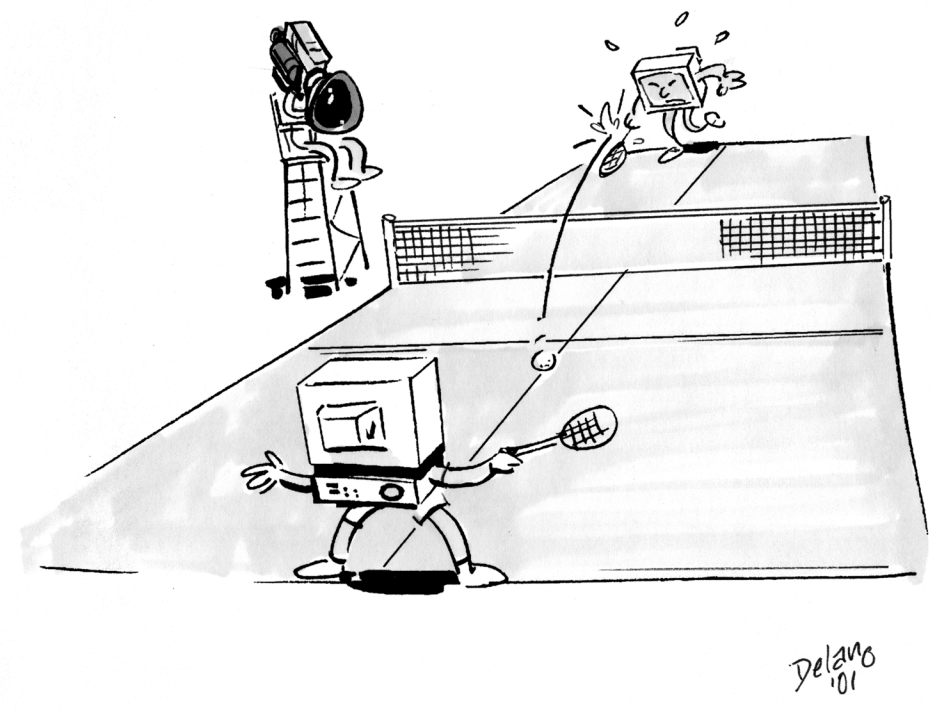
On August 7, 2001, the US Department of Energy awarded Fakespace Systems Inc. a $4.5 million contact to design, build, and install several custom visualization systems at the Laboratory. A business unit of Electrohome Limited, the Canadian company has worked with Los Alamos before in developing and installing digital production systems.

Beginning in 1999, Fakespace installed several large-scale visualization systems at the Laboratory. These systems were designed to help Los Alamos scientists better understand nuclear weapons phenomena through what is called immersive visualization.

For this new contract, Fakespace will work on visualization systems for the Strategic Computing Center (SCC). These systems will include new high-brightness, stereoscopic digital projection technology. Multiple Mirage™ 2000 graphics projection systems, from Christie Digital Systems, will be tiled into a custom-designed, large format WorkWall™ display system for viewing extremel sets in high-resolution detail. Capab million pixels, the full system is exp display of its type ever built.

The new WorkWall systems will display some of the world's largest and most complex simulations, which were developed for the Accelerated Strategic Computing Initiative (ASCI). ASCI uses extensive experimental programs and computer simulation to maintain the safety and reliability of the US nuclear stockpile without underground testing.

More than 80 percent complete, the SCC will be one of the most sophisticated simulation and computing facilities in the world. Housing more than 200 nuclear weapons scientists, engineers, and designers, the SCC will provide large-scale visualization laboratories and a huge visualization theater. The SCC also features an uninterrupted computer floor the size of a football field; on top of this enormous floor will reside a supercomputer capable of performing calculations at 30 trillion operations per second.



Scientific Visualization: Something to RAVE About

By John Quagliano, Dave Modl, Paul Argo, Laura Monroe, Steve Hodson, Jeremy Margulies, Dave Hite, Bob Greene, and Karl-Heinz Winkler, High Performance Computing Environments, CCN-8; and Robert Gurule, Scientific Software Engineering, CCN-12

Introduction

Los Alamos uses many types of advanced technologies to gain new understandings of the physical world. Shown in Fig. 1, the RAVE (Reconfigurable Advanced Visualization Environment) is designed for scientists who need more sophisticated visual representations of complex data acquired through computations and experiments. The RAVE is part of the visualization facilities of the ASCI VIEWS program.

The RAVE was designed, built, and installed by Fakespace Systems Inc., the same company that built the Laboratory's Powerwall and Immersive Workbenches. Conceived in the spring of 1999 (just after the Powerwall had been installed), the RAVE was completed in the fall of 2000 and was demonstrated the week before Christmas 2000. Unlike the Powerwall, the RAVE produces stereographic projections.

CCN-8 collaborates with various groups in other Laboratory divisions, including Advanced Computing, Scientific Software Engineering, Plasma Physics, Thermonuclear Applications, Computational Science Methods, and Weapons Engineering. CCN-8 also maintains contact with groups at Lawrence Livermore National Laboratory and Sandia National Laboratories. Academic and industrial partners include the University of Minnesota, University of New Mexico, SGI Inc., and Fakespace Systems Inc.

By sharing expertise with other organizations, the Laboratory can easily leverage the newest computer hardware and software technologies to best address the needs of scientists performing simulations requiring supercomputer resources. Additionally, half-hour-long demonstrations are routinely arranged for visiting VIPs in both the RAVE and the Powerwall; each month we typically host four to six groups of visitors.

Facility

The Los Alamos facility that houses the RAVE is quite large. The RAVE boxes take up approximately one-half of the available 60-foot square space. To help control the ambient lighting when the RAVE is used, our room has special track lights that can be (1) fully programmed or (2) controlled remotely.

Draperies form a 50-foot square around the center of the room and are approximately 14 feet high, running from the ceiling to the floor, and the floor itself has been carpeted. The projectors are low power and thus are very quiet. All these added amenities provide a pleasant workspace and make using the RAVE a comfortable experience.

Fig. 1. Designed specifically for Los Alamos, this version of the RAVE is the only one of its exact kind and size in the world (for example, NASA-Glenn has a RAVE, but it is smaller).

Hardware Infrastructure

Although much like the CAVE system sold by Pyramid Systems, the RAVE has one principal difference: its projection surfaces are not restricted to one place as in the CAVE, thereby permitting many display-panel orientations. (To download an MPEG movie that illustrates various configurations, go to www.fakespacesystems.com/products1.htm then click on the Workspace -> RAVE link). Each box has a footprint of approximately 10 feet by 12 feet to support the 10-foot square display screen.

The Los Alamos RAVE includes two floor panels for a true virtual reality experience. Possible configurations include a four-wall panel and a one-floor panel "closed box" arrangement, as well as two distinct "quarter box" (or "cove") displays that consist of two wall panels and one floor panel each. Our primary configuration is a two-by-one setup resembling an "open-box" in which there are two displays across the front and one on each side. This configuration provides a viewing space of 20 by 10 feet across the front and the floor and 10-foot square on each left- and right-side panel. The current two-by-one configuration enables us to work in teams and give demonstrations to many people without getting too crowded.

The RAVE units contain an Electrohome Marquee 9500LC projector coupled with mirrors that produce an 18-foot light path to fill the 10-foot square (Fig. 2). These screens provided quite a challenge to get into the room during construction. Each screen weighs approximately 700 pounds; a special tilt-table with suction cup holders was built to move the glass into the room.

The RAVE is fed video and user interfaces from an SGI Origin 2000 computer containing ten Infinite Reality Graphics boards (six are used by the RAVE) located in an adjacent building. Signals are sent via fiber optics using Lightwave Video Display Extention systems. Daryl Grunau of the Advanced Computing Group has written a client-server PERL script that enables us to connect directly to the Infinite Reality Graphics boards in both single- or multi-pipe modes; the latter configuration is often required for interactive visualization of very large data sets.

Fig. 2. Dave Modl of CCN-8 tests the mirrors and projectors inside one of the RAVE boxes.

Visualization Software Applications

Following the installation of the RAVE, we dedicated several months to develop, adapt, and expand many software packages for it. To create a piece of software that could display on all surfaces, students at the University of Illinois-Chicago used a popular tool known as CAVELib (VRCO, Inc.) to create an immersive nature scene environment. The CAVELib tool permits immersive and interactive virtual reality scenes to be created for any non-flat multi-walled arena. CAVELib is an application programmers interface that provides general support for building virtual environments. It handles tasks such as drawing stereoscopic views and organizing multiple processes.

EnSigh® is a commercially available package (see www.ensight.com) that can use multiple flat screens to display images. The Laboratory has a site license for the Gold version of EnSight that runs in parallel on the SGI IRIX operating system. This package was used to project data sets collected from the Cerro Grande Fire (see this issue's inside front cover).

Figure 3 shows a multi-wall application of a red giant star's simulated structure. The data were computed at NCSA using the Piecewise Parabolic Method package to compute the physics and the Hierarchical Volume Rendering package from the University of Minnesota to create a stereo movie with the correct viewing parameters for the RAVE's two-by-one display configuration. Paul Woodward and David Porter (University of Minnesota) and Stephen Hodson (CCN-8) collaborated to produce a short movie. This movie is displayed using a University of Minnesota moviola player modified to playback stereo pair images on multiple displays.

Silicon Graphic's Volumizer package provides real-time interaction with jet data. Figure 4 shows a single time step that can be displayed on all the screens in the RAVE in stereo. Paul Argo (CCN-8) prepared the Volumizer demonstration to view and manipulate the raw volume data from the physics simulation. In this demonstration, the material's transparency can be changed interactively by using the mouse controls.

John Quagliano (CCN-8) has implemented and expanded a tool known as the real-time ray tracer so that it can generate photorealistic ray-traced geometric objects in stereo mode (Fig. 5). This tool was originally developed by the University of Utah, one of the Laboratory's partners under the ASCI alliance. Quagliano has taken this technology and coupled it with the RAVE. The ray tracer uses massively parallel resources to compute a display image's subsections, which are subsequently assembled together to produce the full image. We have used as many as 64 of the 128 processors on the Nirvana visualization computer at the Laboratory to generate this particular image.

Future Work

We are exploring other options to connect the RAVE to other computer systems and expand its capabilities:

- Use a cluster of six Intel-based computers with 3Dlab's Wildcat graphics cards to drive each of the six displays in the RAVE.
- Incorporate a position tracker system to track user's movements in the RAVE.
- Add a surround-sound system to further enhance the immersive capability of the RAVE.

We also are working to adapt other software application packages to the immersive RAVE facility, such as CCS-1's TRex high-performance parallel volume visualization tool (see www.acl.lanl.gov/viz/pr-trex) and CCS-1's and Kitware.com's parallelized vtk Visualization toolkit. We expect the vtk toolkit to integrate smoothly with the CAVELib resources. Finally, we are preparing for the eventual transition to the new Strategic Computing Complex, which will house the new Laboratory supercomputer.

Conclusion

Scientific data have become more complex and data set sizes are getting larger. Display systems used to visualize these data must try to keep pace so that scientists can understand what is being computed. The Fakespace RAVE display system, coupled with parallel software capable of interactive and immersive stereo renderings, can handle these growing visualization needs.

CCN-8 welcomes all inquiries concerning the RAVE. Karl-Heinz Winkler is the CCN-8 Group Leader and Laura Monroe is the Scientific Visualization Team Leader. We are available to discuss how this unique facility, coupled with the expertise of our visualization team, can assist in your scientific endeavors.

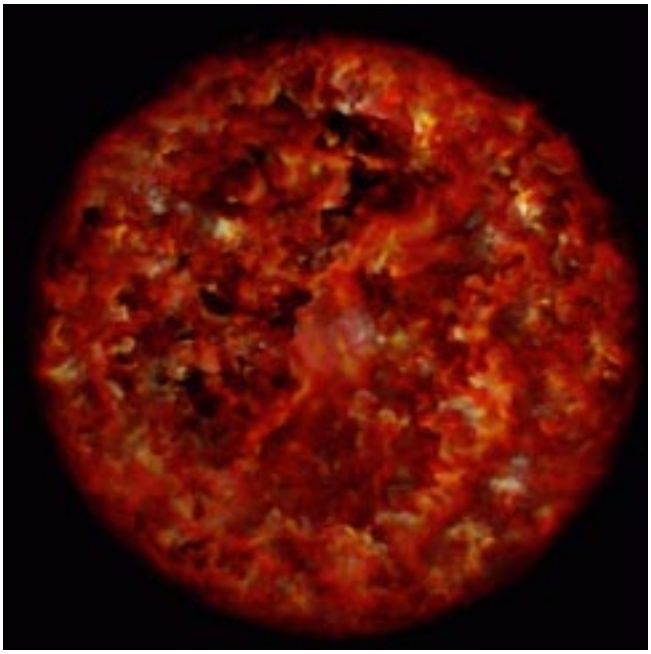


Fig. 3. A volume rendering of a simulated red giant star.

Fig. 4. Using SGI's Volumizer, we created this gray-scale visualization of data shown in the background image found on this issue's front cover.

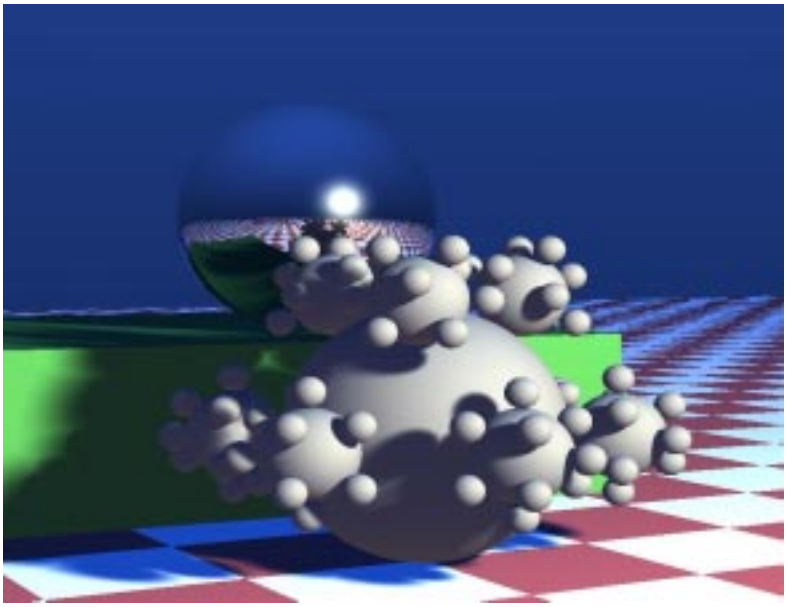


Fig. 5. The real-time ray tracer, when coupled with the RAVE, can produce photorealistic ray-traced geometric objects in stereo mode.

Does Razor Cut It?

By Octavio Ramos Jr., BITS Managing Editor, Communication Arts & Services, IM-1

NASA is using it to manage a new ground-control subsystem, the National Center for Genome Resources is using it to help map the entire human DNA sequence, and Salix Systems is using it to conduct source-code management related to document storage technology. So, what is it? The software in question is called "Razor," and it has made its way to the Laboratory.

"Razor is a tool that is used for three functions," noted Gregg Giesler of Scientific Software Engineering (CCN-12). "The first is issue tracking, the second is configuration management and control of individual files, and the third is release management. Probably the number one function that it is used for at LANL is issues tracking, although my team uses it for all three."

In 1998, Los Alamos began to use Razor as a possible way to meet the configuration management needs of the ASCI (Accelerated Strategic Computing Initiative) project. The ASCI project has purchased a site-wide, unlimited use license, available through ESD, for Razor at Los Alamos. The ASCI team's goal is to create advanced computations modeling and simulation capabilities essential to maintaining the safety, reliability, and performance of the US nuclear stockpile. ASCI is a DOE-wide initiative.

The large teams working on ASCI have recognized the importance of software configuration management in their challenging software development process. Razor is a tool that can help improve the quality of the software being developed for ASCI.

"For the most part it does a very good job," Giesler said when asked for his personal evaluation of Razor. "There are some deficiencies in it that we have discovered. As a result, we are working with Visible Systems Corporation to obtain a source-code agreement so that we can tailor it to the work we do here."

As more and more individuals turn to Razor to meet their configuration management needs, the more questions are raised about the software. In an effort to provide support to the Laboratory's Razor users, Giesler helped establish a Razor Users Group approximately two years ago.

"There are a lot more users of Razor in the Lab now than there were even six months ago. The users group shares successes and problems, but most importantly, it enables us to speak with a united voice when we interact with the company."

For more information about the Razor Users Group, contact Gregg Giesler at giesler@lanl.gov. More information about Razor can be found at the following Web site: www.razor.visible.com.

Information Architecture Project Unveils New and Improved Web Site

By Warren Scoggins,
Communication Arts and Services, IM-1

A Badly Needed Facelift

On May 31, 2001, the Los Alamos Information Architecture (IA) Project launched a new Web site at the following URL: www.lanl.gov/projects/ia/. This new site has been completely revamped—it now sports a new layout, improved usability features, and enhanced technology while retaining virtually the entire original content. From both a technical and a user perspective, the new IA site is a dramatic improvement over the previous version.

Founded in 1994, the old IA site evolved into a long string of HTML files encumbered by obsolete design methods that could not handle the rapidly growing content, which now consists of more than 8000 pages. These factors created many usability problems, with many users complaining that IA Standards were increasingly difficult to find. Moreover, site maintenance had become a burdensome chore with redundant content saved to several directories.

So, what's an organization to do when it has outgrown its Web site? A new design taking advantage of several Web technologies was in order, but how could this be accomplished without having to rewrite most of the pages?

New Look

IM-1 Web designers Amy Parker and Chris Lindberg created a completely new design, one that takes advantage of technologies such as cascading style sheets, CGI (common gateway interface) and administrative scripts programmed in Perl, and SSI (server side include) files that significantly enhance site navigation and ease of maintenance. The designers also created a database for managing content; this database will be used in the future to dynamically deliver Web pages in HTML or XML.

Improving the Design

To ensure the new site was ADA compliant, Kym Kittell of IM-3 (Enterprise Information Infrastructure) performed a usability test on an initial design. This test revealed 10 critical issues, the most significant of which was that users could not easily see the site's primary navigation tool, which consists of navy blue-on-white text tabs at the top of each page. Chris Lindberg made the necessary design modifications to address the issues revealed in the usability test, and the result is the new site's current interface.

The World Wide Web Consortium recommends that sites should use style sheets instead of a FONT tag. Based on such a recommendation, the new IA Web site points to the central resources style sheets by calling the browser and platform sniff Javascript, which then inserts the appropriate style sheet reference. See the resources page (http://int.lanl.gov/resources/css.shtml) for detailed information on cascading style sheets.

The following Javascript reference and custom-style information fell outside the central style sheet's scope. This information was added to an include file referenced by each Web page:

```
<script language="JavaScript"
src="http://www.lanl.gov/styles/detect-cssVerd.js"
type="text/javascript"></script>
```

Improving the Site's Content

Revamping the site's content became the responsibility of IA Project Leader Diane Madrid, former IA Standards Editor Sue King, and current IA Standards Editor Warren Scoggins. Because many users of the old IA site felt that the Standards were too wordy, the content team designed a new template with enhanced appearance and readability.

In addition, Chris Lindberg wrote a Perl script that automatically transfers the existing Standards from the "HTML file format" to the "include file format" used by the new site. As Standards are renewed, they are rewritten to correct excessive wordiness and moved to the new template. Other similar Perl scripts enabled the text content from the old HTML files to be assimilated automatically into the new Web pages. This process eliminated the need to rewrite most of the content, thereby saving countless hours of editing and formatting.

The IA site has content on both the yellow and green networks. The green Web server contains Standards, Policies, news, and general information; the internal-only yellow server contains Request for Comments (RFCs) and team information. The site is managed using Macromedia's Dreamweaver 4 and several administrative Perl scripts.

New Features

The IA site now has subject ties, which consist of quick links to IA RFCs, Standards, Policies, White Papers, and other publications; training information; general IA information; and a detailed site map. The IA home page keeps visitors informed with links to the latest CERT® and internal IA advisories regarding application vulnerabilities and operability problems. Current events of interest to users are listed, as well as hot topics such as the PC migration toward Windows 2000. Outdated news features are archived and remain easily accessible after they are removed from the home page.

The new site also enables users to find Standards by using a variety of lists that catalogue them by IA number, document title, or team of ownership. Links to Standards listed by user group remain in the left-hand navigation column of each page. A user looking for IA Standards for their PC can click on PC USER and obtain only the Standards pertinent to the PC platform. Maintenance of these lists is made easier by tracking Standards and their related information in a Microsoft Access database. When changes to an IA Standard occur, a comma-delimited file is generated and passed to an administrative Perl script. The script automatically generates new include files that populate the IA Web site.

CGI scripts enable access to IA RFCs, Standards, Policies, and team minutes. These scripts offer Web or print versions of each document. Moving the IA Standards from HTML files to their new CGI location required changing the majority of the site's links. To accomplish this, Chris Lindberg used BareBone's BBEdit's find-and-replace tool with the grep feature activated for extended pattern matching. Similar to using regular expressions in Perl, the BBEdit tool allows for wildcard matching and string saving for use in the replacement text.

Each of the nine IA teams has its own home page within the site that features team-specific events and information. The left-side navigation provides links to the team's Standards, RFCs, meeting schedules and minutes from past meetings, charter, current roster, FAQs, and their own password-protected private work area where team members can post information and share files.

The old site used .html files—the new site uses SSI equivalent .shtml files. Before the new site went online, the IA administrators needed a way to redirect requests from the old .html to the new .shtml files. To accomplish this, Lindberg used Apache's Mod Rewrite in a .htaccess file:

```
RewriteEngine on
RewriteBase /projects/ia/
RewriteRule ^(.*)\.html$ $1 [C,E=WasHTML:yes]
RewriteCond %{REQUEST_FILENAME}.shtml -f
RewriteRule ^(.*)$ $1.shtml [S=1]
RewriteCond %{ENV:WasHTML} ^yes$
RewriteRule ^(.*)$ $1.html
```

A custom error page for missing documents (404) was also created to assist users find pages that had disappeared in the redesign. It is referred to in the .htaccess file:

```
ErrorDocument 404 /projects/ia/missing.shtml
```

The Los Alamos Information Architecture Project redesigned its Web site to make it even easier to use.

Building A Secure Information Community—It's B.A.S.I.C.

By Bill Robertson, Customer Service, IM-2

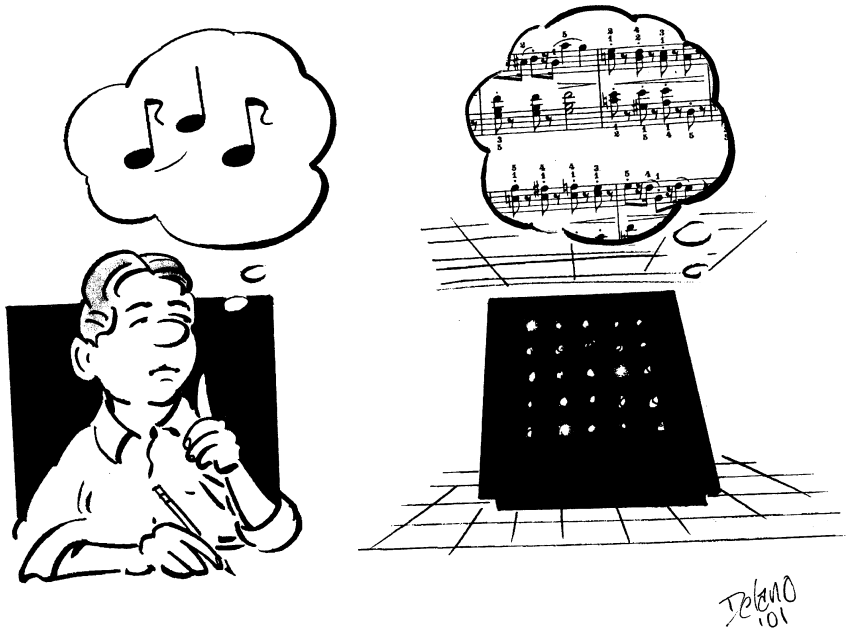
A free resource, Computer B.A.S.I.C. Training has been designed to help new Laboratory employees become familiar with practical and necessary information about the computer resources at Los Alamos. Anyone using a computer at the Laboratory benefits from this class: University of California employees, contractors, Plus Group, students, etc.

Designed by Amy Meilander (CCN-5, the Network Engineering Group) and Bill Robertson (IM-2), the computer-driven seminar enables new users to control their own learning while exploring the wealth of computing resources at the Laboratory. The seminar is designed so that participants learn in a hands-on environment.

The seminar consists of five sections: beginnings, acceptable use, security, informational, and computing. The purpose of these sections is to give new employees an opportunity to locate useful information that will enable them to orient themselves successfully as a computer user at Los Alamos. The class is run through the following Web site: http://int.lanl.gov/orgs/im/im2/basic/index.htm. A classroom instructor acts as the seminar's facilitator.

There are three basic areas of computer communications at Los Alamos that are especially important to all new employees: (1) using browsers to locate Web sites, (2) using email to communicate, and (3) accessing Laboratory systems with a Token Card. Much of the information at the Laboratory is accessed via Web sites, and Computer B.A.S.I.C. Training at Los Alamos is designed to consolidate many of the useful Web resources into a central location so that they can benefit new users.

To sign up for this free class, please visit the Virtual Training Center at the following Web site: http://www.lanl.gov/labview/training/training.html. When you have accessed this site, select the "Computer" link on the left-hand side of the screen, then click "LANL Computing Fundamentals," and finally click on "Computer B.A.S.I.C. Training at LANL."



Nightly Regression Testing of MCNPX

By Teri Roberts and Skip Egdorf, Advanced Information and Business Application Development, IM-8; and Laurie Waters, Nuclear Systems Design and Analysis, D-10

Introduction

When many developers concurrently work on a computer code, unforeseen interactions between different developers can create subtle inconsistencies commonly known as bugs. In an effort to identify such bugs, we subject the code to nightly regression testing. Unfortunately, individual developer testing can prove difficult for codes designed to be portable for many different operating environments.

A configuration management repository can help address these problems because such a centralized system will enable researchers to conduct regular and systematic regression tests of the code as it is developed. This article describes such an approach to configuration management and nightly regression testing. Researchers at Los Alamos National Laboratory are successfully using such an approach while developing a Monte Carlo radiation transport code known as MCNPX.

What is MCNPX?

A general purpose Monte Carlo N-Particle code, MCNP can be used to simulate neutron, photon, electron, or coupled neutron/photon/electron transport through different materials. Originally developed during the Manhattan Project, the MCNP code has been extensively refined ever since.

Los Alamos began the MCNPX project in 1995 under the Accelerator Production of Tritium program. The project's goal was to extend the capabilities of MCNP to all particles and energies. MCNPX includes the use of physics models to compute interaction probabilities in which tabular cross-section data are not available. Physics models are currently included from LAHET and CEM high-energy codes.

MCNPX extends the traditional user base of MCNP in significant ways. Principal applications include

- designing neutron spallation sources,
- creating and destroying radionuclides in accelerator environments,
- designing accelerator shielding design, as well as conducting health physics and dosimetry calculations,
- implementing medical applications such as proton therapy and the design of sources for Born Neutron Capture Therapy,
- conducting high-altitude aircraft dosimetry,
- shielding spacecraft and evaluating single-event effects,
- assessing material damage in accelerator environments, and
- designing radioactive ion-beam targets.

The code and associated nuclear data libraries are developed and maintained at Los Alamos by project participants from several groups, such as CCS-4, D-10, IM-8, LANSCE-12, X-5, and T-16. Export control approved distributions of the code and manuals for MCNP[1] and MCNPX[2] can be obtained from the Radiation Safety Information Computational Center in Oak Ridge, TN.

Why Nightly Tests?

Several different code developers on a regular basis make changes to the MCNPX code. These simultaneous changes may implement a new physics modeling capability, represent bug fixes, or implement components of a new architectural infrastructure for modernizing the existing code base. We must ensure the integrity of the code after any change because it is destined ultimately for international distribution to many end users who use a variety of computing platforms.

Test Limitations

A specially constructed set of roughly 40 to 50 different test problems provides regression tests for the code. These tests range from code-coverage tests that exercise a large percentage of the code to physics-model-validation tests that exercise specific code features. A set of expected results is compared to a set of computed results. When the answers are a "close-enough" match, we declare that the tests "track" the existing expected answers. Preventing some exact matches are round-off errors on various platforms that use different math library versions.

The Development & Test Environments

Our code developers are spread throughout the Laboratory in different physical locations. To achieve one shared logical working environment, we use a network of computers. Each MCNPX team member has one or more computers on his or her desk. In addition to these personal machines, a set of test machines also has been established.

All machines run some variant of the UNIX operating system (OS). Most test farm machines have been rescued from salvage, although one has been purchased. One machine is designated as the master source code server via a CVS (concurrent versioning system) repository. Each team member has access to this repository. In addition to the team member accounts, there is one special project account used by the regression test program.

Shell and Perl Scripts

The following steps are outlined in Fig. 1:

Step 1. Each night at a designated time, the OS cron command activates the regression test driver program. Using a special project account, the regression test driver program makes sure that the most recent version of the code from the CVS repository is placed into a common shared file partition located on one of the test farm machines. To ensure that all the test farm machines have access to this common file partition, it is exported onto the network. As a result, the same code is used on various hardware platforms.

Step 2. During this step, the regression test driver program performs a login for each test farm machine. It also runs a shell script to "configure" the source code for a particular 'hardware/OS/Fortran77 compiler/C compiler' combination being tested (Table 1 provides a list of all platform configurations). After a successful configuration, the shell script "makes" the MCNPX executable program and performs a "make tests" command to activate the tests. These special "make" commands are generated output that results from the configure step.

Step 3. All the generated output from the shell-script execution is captured on each tested machine. On the following morning, we gather and examine the output from each platform.

Our future development plans for this regression test capability include (1) automated checking of all generated output on each platform and (2) creating a page on the World Wide Web so that developers can evaluate progress.

Careful Introduction of New Capability

As shown in the Linkage Used column of Table 1, we are introducing the ability to use dynamic linking or shared object libraries with MCNPX. This capability is the first step in introducing new capabilities to this mature and extremely valuable code. We must not cause perturbations in any of the physics models as we erect a new infrastructure that enables us to use the code in new ways. With regular regression testing, we can prove that the changes introduced to the infrastructure have not affected the internal computational physics models.

Table 1. Test Farm Hardware/Software/Compiler/Linkage Combinations

Hardware	Operating System	Fortran Compiler	C Compiler	Linkage Used
Sun	Solaris	f77	cc	static, shared
Sun	Linux 6.x	g77	gcc	static, shared
Alpha	True64	fort	cc	static, shared
Alpha	Linux 6.x	g77	gcc	static
HP	HPUX	fort77	cc	static, shared
SGI	IRIX (32 bit)	f77	cc	static, shared
IBM	AIX	f77	cc	static
Intel PC	Linux 6.x	f77	cc	static, shared
Intel PC	Linux 6.x	pgf77	cc	static, shared
Intel PC	Linux 7.x	g77	gcc	static

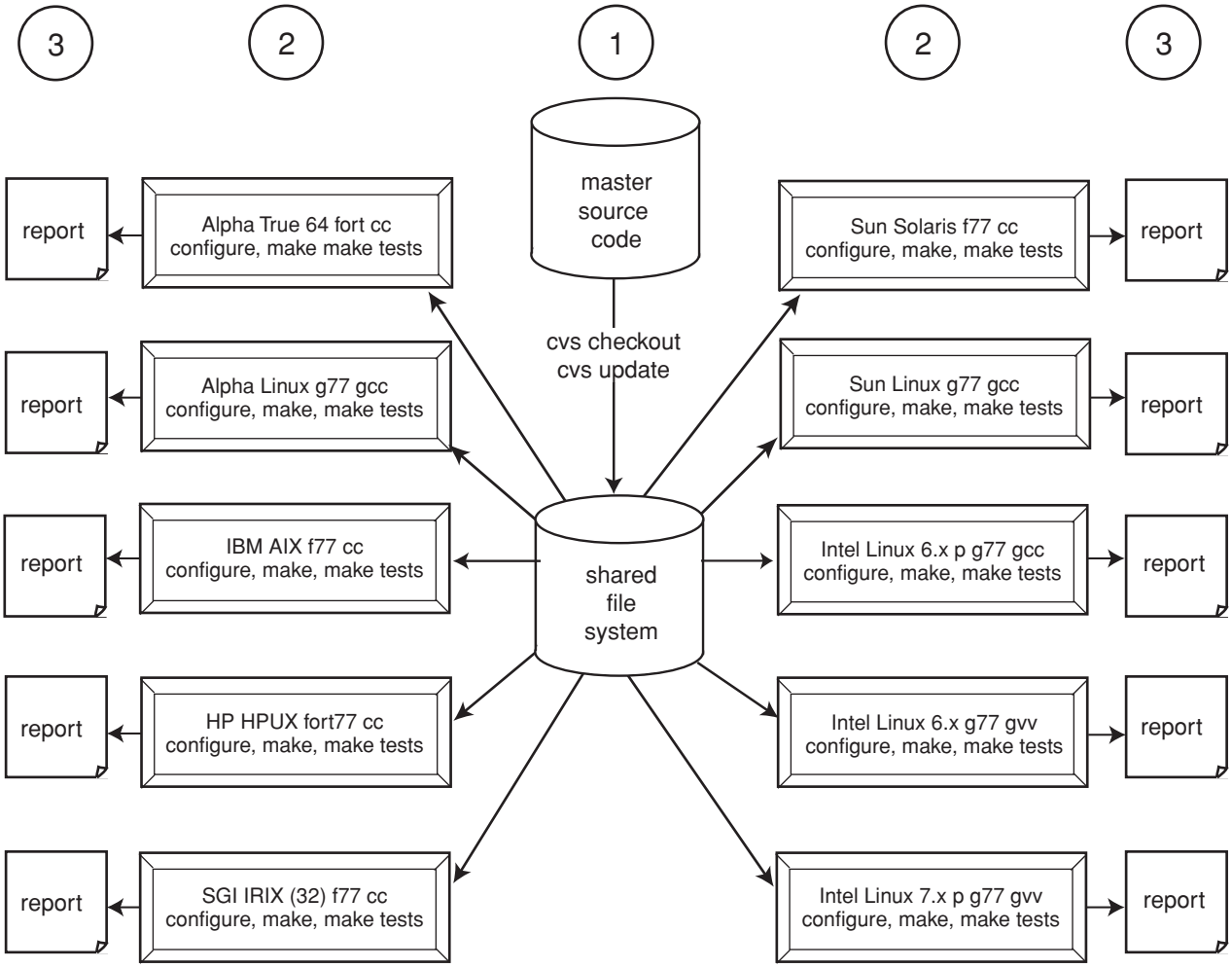
Benefits of Nightly Tests

Running code on a variety of compilers and operating environments helps us discover questionable coding and subtle errors. Each compiler complains about different things. The development cycle is more efficient.

Instead of each developer spending great amounts of time moving various versions of the code to each platform and testing in an ad hoc fashion, developers can now spot-check the code locally on one or two platforms and trust the clean nightly builds to uncover systematically the odd system dependencies. A baseline history of flaws can now be maintained, thus allowing for future improvements in the development process.

[1] J. F. Briesmeister, ed., "MCNP—A General Monte Carlo N-Particle Transport Code, version 4B," Los Alamos National Laboratory report LA-12625M, March 1997.

[2] Laurie S. Waters, ed., "MCNPX User's Manual, Version 2.1.5," Los Alamos National Laboratory publication LA-UR-99-6058, November 14, 1999.



We use this sequence of regression test steps to help us discover questionable coding and subtle errors in computer codes.

John Carson Leads Laboratory Cyber Security Efforts

By Octavio Ramos Jr., BITS Managing Editor, Communication Arts & Services, IM-1

Imagine a device that from a considerable distance can remotely access a computer terminal and download information. Sound like science fiction? Well, this technology, known as "Bluetooth," is already developed and will be available as early as two years from now.

At Los Alamos, almost everyone has a computer. Because of the nature of some of the Laboratory's work, some computers hold classified information. How does the Laboratory protect such material from technologies like Bluetooth?

As classified information systems security site manager and team leader for Cyber Security housed in the Office of the Chief Information Officer, John H. Carson has been tasked to find solutions to such complex issues. Carson may be relatively new to the job, having been named to the position on June 25, 2001, but his experience in security dates back to the 1960s, when he served with the US Navy.

"I was a Navy flight instructor in Monterey, California," remembered Carson. "I trained pilots who were engaged in the Vietnam conflict."

Before coming to the Laboratory in 1989, Carson worked at a number of private firms, including his own company. He started at Xerox, where he learned the fundamentals of electro-optical technology.

Carson then went on to found Photometric Data, where he designed microdensitometers, which are instruments that convert film to computer information at incredible rates. Whereas most scanners work at hundreds of dots per square inch (dpi), microdensitometers work in the thousands, at times even higher than 25,000 dpi.

"In 1993, Perkin-Elmer bought our company," Carson said. "They combined the microdensitometers with telescope technology so that end users could create high-resolution digital images of stellar photographic plates."

From 1978 to 1988, Carson worked for EG&G, where he managed the image processing lab and conducted work for the nuclear weapons program. It was here that Carson began to harness his experience to develop security countermeasures for computers.

In 1989, Carson came to the Laboratory, where he worked in image processing and on projects such as PINS, a proliferation tracking system. For the next 11 years, Carson became immersed in the world of top secret and other classified work. In addition to gaining more experience in traditional

security measures, Carson also learned about the many security issues involving single- and multi-user secure computer and distributed computing platforms.

"In this environment, you live and breathe security," said Carson. "The team is so small and dedicated that security literally becomes part of your cultural makeup. In all the years I worked in this environment, we never had a security infraction or reportable incident."

When Carson learned that Computer Information Officer Richard P. Kendall was looking for someone to lead a computer security effort at a Laboratory scale, he was immediately interested.

"I wanted the Laboratory to take advantage of my experience and expertise," Carson noted. "I believe that if you make security simple—if you make it understandable—then you are likely to succeed."

When asked how he sees his role in cyber security, Carson said the following: "I see myself as a focal point for establishing uniform policy and information. I want anyone who calls us for help to get the same answer. I also act as the interface between the Department of Energy and Laboratory users. Again, this office will provide uniform answers so that our users will do well during audits. In addition, we will provide training and review security plans, thus ensuring that users never feel they are alone when it comes to protecting the Laboratory's classified knowledge."

As for the future, Carson is presently ramping up his team to address both personnel and technological issues. "The Lab is a big place," he noted. "And with the construction of the Strategic Computing Center and the

Get to Class!

By Octavio Ramos Jr., BITS Managing Editor, Communication Arts & Services, IM-1

On September 6, 2001, the Information Management Customer Service Group (IM-2) held an open house to celebrate IM-2's new computer classrooms, which are located at the new Research Park Building north of the Otowi Building.

Instructors from IM-2's Computer Education and Training team were on hand to answer questions regarding the many computer training courses available at the Laboratory. IM-2 covers the training gamut, from special and advanced computer courses related to the ASCI program to communication applications such as Eudora and Meeting Maker. The group also offers courses for new computer users and required computer security courses for everyone at the Laboratory.

Also at the open house were consultants from IM-2's Enterprise Information Applications (EIA) team. EIA applications important to the Laboratory include travel and the time and effort system.

So, how do you get to this new building? Enter the building from the east side (the side facing the Los Alamos Fire Station) and take the elevator to the second floor. Once there, pass through the doors immediately to the right of the elevator then turn right. The new classrooms are conveniently located next to the Hot Rocks Java Café.

If you are interested in taking a computer course, call 667-9559 or send an email to im2-training@lanl.gov. For a course listing, visit the following Web site: www.lanl.gov/labview/training/computer.html.

New classrooms at the Laboratory's Research Park are ready to serve Lab employees interested in taking computer classes.

Los Alamos Computer Science Institute Holds Second Annual Symposium

By Octavio Ramos Jr., BITS Managing Editor, Communication Arts & Services, IM-1

The Los Alamos Computer Science Institute held its Second Annual Symposium at the Eldorado Hotel in Santa Fe from October 15 through 18, 2001. The conference enabled researchers to highlight their work and helped participants develop collaborations between DOE laboratories, industry, and academia.

Two kinds of original research results were solicited: (1) speculative, long-term research with high-impact potential, if successful, and (2) application-related research in scientific, high-performance computing.

The conference consisted of an opening reception and poster session, two days dedicated to the presentation of technical papers, and one day of informal workshops. A variety of topics were covered at the conference, such as

- computational mathematics,
- grid computing,
- innovative architectures and systems,
- networking and communication,
- parallel algorithms, and
- scalable performance tools.

All accepted papers were available on CD-ROM at the conference. Selected papers have been published in a special issue of *The Journal of Supercomputing*. For more information, please visit the following Web site: www.wkap.nl/journals/tjs.

Supercomputing Conference Scheduled for November 2001

By Octavio Ramos Jr., BITS Managing Editor, Communication Arts & Services, IM-1

For more than a decade the Supercomputing Conference has fostered collaborations between industry and academia in the world of high-performance computing and communications. Chaired by CCN-DO's Charlie Slocomb, this year's conference will take place in Denver, Colorado, from November 10 through 16, 2001.

Sponsored by the IEEE Computer Society and the Association for Computing Machinery/Special Interest Group on Computer Architecture, the Supercomputing Conference also involves volunteers from

- Argonne National Laboratory,
- Lawrence Livermore National Laboratory,
- Los Alamos National Laboratory,
- National Center for Atmospheric Research,
- National Science Foundation Supercomputer Centers,
- NASA-Ames Research Center,
- Society for Industrial and Applied Mathematics, and
- Center for Computing Sciences.

The following are some of the many events that will take place at the conference:

Birds-of-a-Feather Sessions: These sessions offer conference attendees the opportunity to discuss topics of mutual interest.

HPC Games: Designed to test the mettle of high-performance computing teams, these games are designed to demonstrate the virtuosity of high-performance computation.

Exhibitor Forum and Posters: Exhibits help attendees keep abreast of new products, whereas poster sessions allow them to learn about the latest trends and research projects in supercomputing.

Tutorials: One of the highlights of the conference, these tutorials offer attendees short courses in fields related to supercomputing and the efficient implementation of grand-challenge applications to high-performance computers.

Technical Papers: Papers report on experimental or theoretical results, innovative designs, and case studies related to high-performance networking and computing.

For more information about the Supercomputing Conference, please visit the following Web site: www.sc2001.org.

Computer Training

The Customer Service Group (IM-2) offers technical computer training (Enterprise Information Applications, communications, office administration, and Web authoring) and advanced computer training (programming languages, system administration, and advanced applications). To register for a course access our Web page at http://www.lanl.gov/internal/training/training.html . Or from the LANL home page select the links: Training, Computer. For further information about technical computer training call (505) 667-9559, and for advanced technical computer training call (505) 667-9399.

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Enterprise Information Applications (EIA)	**Other EIA Courses**	**System Administration Training**
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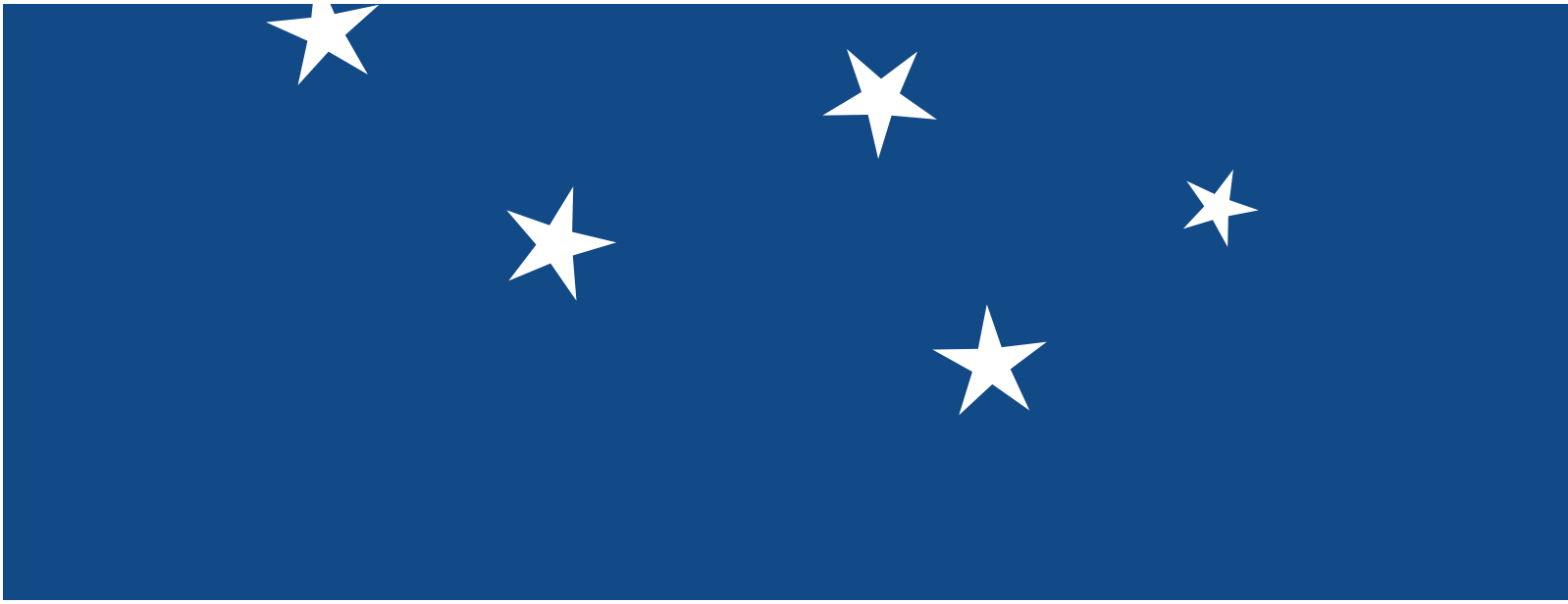

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